

(Set-R₁)

B.Tech - 2nd
Basic Electrical Engineering

Full Marks : 70

Time : 3 hours

Answer Q. No. 1, which is compulsory and
five from the rest seven questions

The figures in the right-hand margin indicate marks

1. Answer the following questions : 2 × 10

(a) Find the equivalent resistance between X and Y in the figure 1. All resistances values are in Ω .

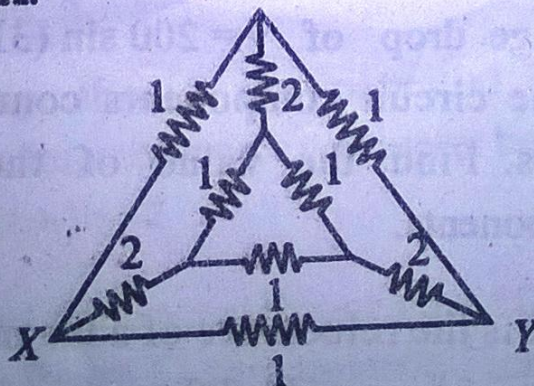


Figure 1

(Turn Over)

(2)

- (b) In the circuit shown in figure 2, switch 'S' is closed at $t = 0$. After sometime, when the current in the inductor was 6A, the rate of change of current through it was 4A/sec. What is the value of the inductance 'L'?

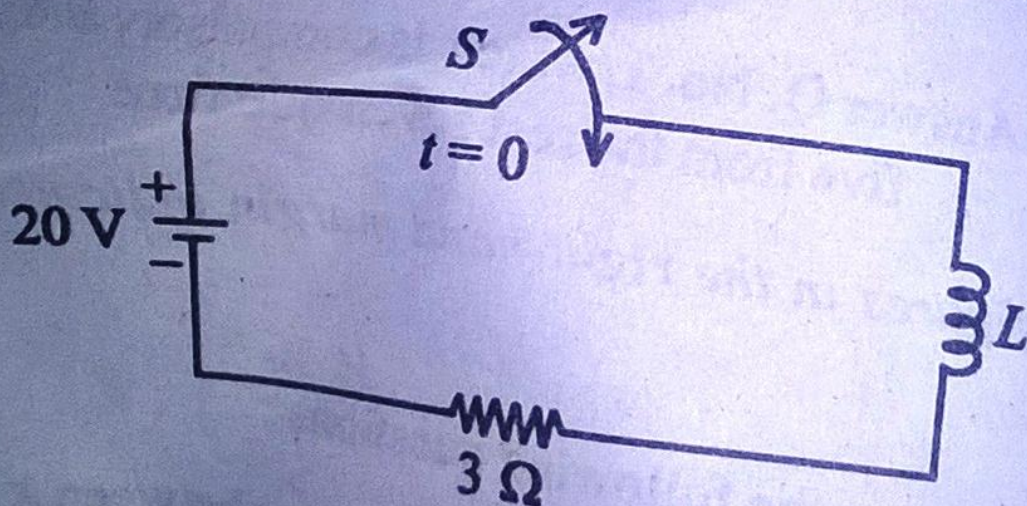


Figure 2

- (c) A current $i = 5 \sin(314t - 10^\circ)$ produces a voltage drop of $v = 200 \sin(314t + 20^\circ)$ in the circuit components connected in series. Find the value of the circuit components.
- (d) What is the reluctance of a magnetic core that is 1.25 cm wide, 2.0 cm

(3)

long and has a permeability of 12.5×10^{-4} Wb/A-T-m ?

(e) What are the requirements for self excitation of dc shunt generator ?

(f) What is the condition for dc motor for delivering maximum power ?

(g) Give the merits of an autotransformer over two winding transformer of same rating.

(h) The supply frequency of a 6 pole induction motor is 50 Hz. The frequency of its rotor current is 2 Hz. What is the speed of the motor and its slip ?

(i) Explain why a synchronous motor is not self starting.

(j) Why should the potential coil of a dynamometer type wattmeter be highly non-inductive ?

2. (a) Find the current through the 5Ω resistor in the figure 3 using superposition theorem. 5

(4)

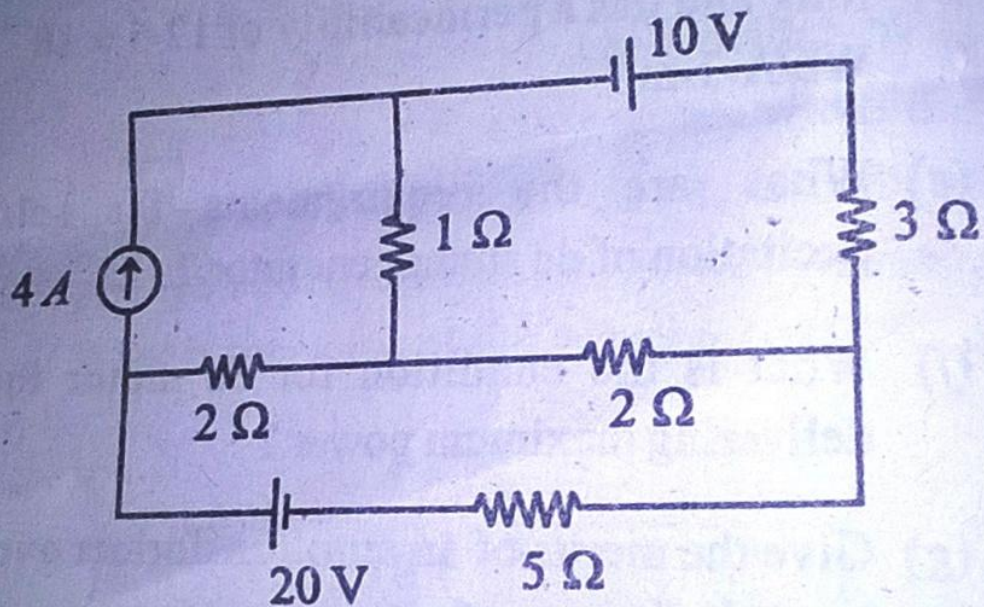


Figure 3

- (b) In the circuit given in figure 4, the switch 'S' is closed at time $t = 0$. Determine the time required for the energy stored in the capacitor to reach 90% of the maximum Value. Assume initial capacitor charge to be zero.

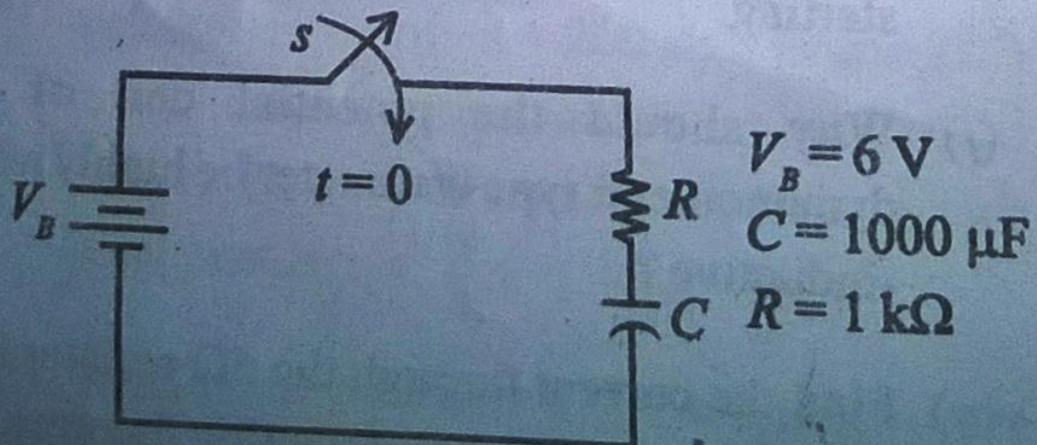


Figure 4

(5)

3. (a) A $100\ \Omega$ resistor, $20\ \mu F$ capacitor and a $2\ H$ inductor are connected in series. At what frequency is the phase angle 45° . 5
- (b) A balanced delta connected load of $(8 + j6)\ \Omega$ per phase is connected to a 3-phase $230\ V$ supply. Find the line current, power factor, power, reactive power and total volt-amperes. 5
4. (a) An iron ring with a mean circumference of $140\ cm$ and cross-section $12\ cm^2$ is wound with 500 turns of wire. When the exciting current is $2\ A$, the flux is found to be $1.2\ mWb$. Determine relative permeability of iron. 5
- (b) What is meant by hysteresis loop ? What is its significance ? How do you reduce the hysteresis loss ? 5
5. (a) A dc shunt generator supplies a load at the voltage of $230\ V$. The armature resistance of the generator is $0.03\ \Omega$ and the field resistance is $120\ \Omega$. Determine the value of

(6)

load current and load power when it generates an emf of 240 V. The effect of armature reaction may be neglected. 5

(b) A 250 V dc shunt motor on no load runs at 1000 rpm and takes 5A. The total armature and shunt field resistances are respectively 0.2Ω and 250Ω . Determine the speed when loaded taking a current of 50 A, if armature reaction weakens the field by 3%. 5

6. (a) Explain the operation of a synchronous motor when a change in load on the motor takes place. 5

(b) Explain with the help of schematic diagram the principle of operation of 1-phase split phase induction motor. 5

7. (a) Explain with neat diagram the working principle of a moving iron ammeter. Give its applications. 5

(b) Explain the construction and principle of operation of an induction type energy meter. 5

(7)

8. (a) With a schematic diagram, explain principle of the generation of electric power in a hydél power plant. 5
- (b) Explain various schemes of distribution of electrical energy. 5
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